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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/707,365	12/09/2003	Kenneth Boyd	81044284FGT1838PUS	1364

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EXAMINER	
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ART UNIT	PAPER NUMBER
2128	

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Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/707,365	BOYD ET AL.	
	Examiner	Art Unit	
	Kimberly Thornewell	2128	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *09 December 2003*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-29* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-29* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *09 December 2003* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *12/9/03*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

1. Claims 1-29 have been presented for examination.

Information Disclosure Statement

2. The information disclosure statement (IDS) submitted on 12/9/2003 is in compliance with the provisions of 37 CFR 1.97. Accordingly, the information disclosure statement is being considered by the examiner.

Double Patenting

3. The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. A nonstatutory obviousness-type double patenting rejection is appropriate where the conflicting claims are not identical, but at least one examined application claim is not patentably distinct from the reference claim(s) because the examined application claim is either anticipated by, or would have been obvious over, the reference claim(s). See, e.g., *In re Berg*, 140 F.3d 1428, 46 USPQ2d 1226 (Fed. Cir. 1998); *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) or 1.321(d) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent either is shown to be commonly owned with this application, or claims an invention made as a result of activities undertaken within the scope of a joint research agreement.

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

4. Claims 1 and 12 are provisionally rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 1 and 4, respectively, of copending Application No. 10/707,368. Although the conflicting claims are not identical, they are not patentably distinct from each other because claims 1 and 12 of the instant application contains every element of and therefore anticipates claim 1 and 4 of the copending application.

Claim 1 of each application reads as follows:

Instant Application Claim 1	**Copending App. 10/707,368 Claim 1**
A simulation system for simulating an operation of an automotive vehicle comprising:	A simulation system for simulating an operation of an automotive vehicle comprising:
An input providing vehicle information and path information;	An input providing vehicle information and path information;
A controller having a vehicle computer model therein,	A controller having a vehicle computer model therein,
Said controller programmed to **determine an initial steering wheel angle input to the computer model;**	Said controller programmed to determine a curvature of an intended path from the path information;
Determine a first steering wheel angle input to the computer model at a time later than	Determine a look ahead scale factor as a function of the intended path;

the initial steering wheel angle input by comparing a look ahead point and an intended path;	
	Determine a look ahead point as a function of the look ahead scale factor;
When the vehicle model is understeering, operate the computer model with the steering wheel angle input **until an error of the first steering wheel angle and the initial steering wheel angle is decreasing; When the error decreases,** operate the computer model with the first steering wheel angle input; and	Operate the computer model with the steering wheel angle input; and
Generate an output in response to the vehicle model and the initial steering wheel input or the first steering wheel input.	Generate an output in response to the vehicle model and the initial steering wheel input or the first steering wheel input.

Claim 12 of the instant application and claim 4 of the copending application read as follows:

Instant Application Claim 12	**Copending Application 10/707,368 Claim 4**
A method of operating a vehicle computer model having vehicle information and path	A method of operating a vehicle computer model having vehicle information and path

information therein comprising:	information therein comprising:
Determining a **an initial steering wheel angle input to the computer model;**	Determining a curvature of an intended path from the path information;
Determining a first steering wheel angle input to the computer model **at a time later than the initial steering wheel angle input** by comparing the look ahead point and an intended path;	Determining a look ahead scale factor as a function of the intended path;
	Determining a look ahead point as a function of the look ahead scale factor;
	Determining a steering wheel angle input to the computer model by comparing the look ahead point and the intended path;
When the vehicle model is understeering, operating the computer model with the steering wheel angle input; and **when the error decreases,** operating the computer model with the first steering wheel angle input.	Operate the computer model with the steering wheel angle input;

As per claim 1, the claimed determining of "an *initial* steering wheel angle input to the computer model" of the instant application is not claimed in the copending application. The determining of a first steering wheel angle input "at a time later than the initial steering wheel

angle input" of the instant application is also not claimed in the copending application. However, these limitations merely further define the system in claim 1 of the copending application, and the system of claim 1 of the instant application does not result in a different invention from that of the copending application.

As per claim 12, the claimed determining of a "an *initial* steering wheel angle input to the computer model" of the instant application is not claimed in the copending application. The determining of a first steering wheel angle input "at a time later than the initial steering wheel angle input" of the instant application is also not claimed in the copending application. However, these limitations merely further define the method in claim 4 of the copending application, and performing the method of claim 12 of the instant application does not result in a different invention from that of the copending application.

This is a provisional obviousness-type double patenting rejection because the conflicting claims have not in fact been patented.

Specification

5. The title of the invention is not descriptive. A new title is required that is clearly indicative of the invention to which the claims are directed. The claims appear to be directed towards determining understeer conditions. However, the title implies that the invention is directed to determining oversteer.

Claim Rejections - 35 USC § 112

6. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

7. Claims 9-11 and 18-29 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claims 9-11 and 18-20 recite the limitation "the previous steering wheel angle input." There is insufficient antecedent basis for this limitation in the claim. Furthermore, one of ordinary skill in the art would not know how to interpret the word "previous" because the claims only make reference to two steering wheel angle inputs (the "initial" input and the "first" input). Therefore the question is raised whether the "previous" steering wheel angle input is to mean the "initial" steering wheel angle input.

Claim 21 makes reference to "current" steering wheel angle inputs in line 4. One of ordinary skill in the art would not know what would make an input a "current" one. Claim 21 also makes reference to holding a steering wheel angle to "a first" steering wheel angle input. It is unclear whether this is supposed to refer to *the* first input, or one of the first inputs. If the latter is true, then it is unclear which inputs of the plurality of inputs would be considered the "first" ones. It is also unclear how one of the first inputs would be selected over the others to be used as the steering wheel angle. Claims 22-29 are rejected because of their dependence on claim 21.

Claim 24 recites the limitation "normalized yaw acceleration" in line 1. There is insufficient antecedent basis for this limitation in the claim.

Claim Rejections - 35 USC § 101

8. 35 U.S.C. 101 reads as follows:

> Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

9. Claims 12-29 are rejected under 35 U.S.C. 101 because the claimed invention is directed to non-statutory subject matter. Claims 12 and 21 are directed to methods of operating a vehicle computer model. These claims are interpreted to be software, per se. The methods result in determining a steering wheel angle input, and operating the computer model with the steering wheel angle input. However, the Applicant has not disclosed a tangible way in which the model is operated. Dependent claims 13-20 and 22-29 are rejected because they also do not set forth a tangible way in which to operate a computer model.

Claim Rejections - 35 USC § 102

10. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

11. Claims 1-5, 8-9, 12-14, 17-18, 21-22 and 25-27 are rejected under 35 U.S.C. 102(b) as being anticipated by Ravani et al., US Patent No. 5,979,581.

As per claim 1,

Ravani discloses a simulation system for simulating an operation of an automotive vehicle comprising:

- In input providing vehicle information **(figure 1 reference 12)** and path information **(figure 1 reference 20)**; and
- A controller coupled to the input **(figure 1 reference 16)**, said controller having a vehicle computer model therein **(column 5 lines 57-59)**, said controller programmed to:
    - Determine an initial steering wheel angle input to the computer model **(column 8 lines 13-19, initial steering wheel angle input taught as 0 for a straight roadway)**;
    - Determine a first steering wheel angle input to the computer model at a time later than the initial steering wheel angle input by comparing a look ahead point and an intended path (**column 2 line 39-42**);
    - When the vehicle model is understeering, operate the computer model with the initial steering wheel angle input until an error of the first steering wheel angle and the initial steering wheel angle is decreasing (**figures 6b and 6d, shown as steering input remaining at 0 until t=5s**);
    - When the error decreases, operate the computer model with the first steering wheel angle input (**figures 6b and 6d, shown as steering input being above 0 when t>5s**); and
    - Generate an output in response to the vehicle model and the initial steering wheel input or the first steering wheel input (**column 8 lines 52-57**).

As per claim 2,

Ravani discloses the controller controlling an output device in response to the vehicle model and the initial steering wheel input (**column 8 lines 52-57**).

As per claim 3,

Ravani discloses the model comprising a dynamic control model **(column 5 lines 57-59)**.

As per claim 4,

Ravani discloses the controller determining when the vehicle model is understeering in response to a yaw acceleration (**column 6 equation 11**).

As per claim 5,

Ravani discloses the controller determining when the vehicle model is understeering in response to a yaw acceleration and an increasing steering wheel angle (**column 6 equations 12 and 13**).

As per claims 8 and 9,

Ravani discloses the controller determining the error in response to a decreasing steering wheel angle and the previous steering wheel angle and the first steering wheel angle input (**column 8 lines 25-45**).

As per claim 12,

Ravani discloses a method of operating a vehicle computer model having vehicle information **(figure 1 reference 12)** and path information **(figure 1 reference 20)** therein comprising:

- Determining an initial steering wheel angle input to the computer model **(column 8 lines 13-19, initial steering wheel angle input taught as 0 for a straight roadway)**;
- Determining a first steering wheel angle input to the computer model at a time later than the initial steering wheel angle input by comparing a look ahead point and an intended path **(column 2 line 39-42)**;
- When the vehicle model is understeering, operating the computer model with the initial steering wheel angle input until an error of the first steering wheel angle and the initial steering wheel angle is decreasing **(figures 6b and 6d, shown as steering input remaining at 0 until t=5s)**;
- When the error decreases, operating the computer model with the first steering wheel angle input **(figures 6b and 6d, shown as steering input being above 0 when t>5s)**;

As per claim 13 and 14,

Ravani discloses determining when the vehicle model is understeering in response to a yaw acceleration and an increasing steering wheel angle **(column 6 equations 12 and 13)**.

As per claims 17 and 18,

Ravani discloses determining the error in response to a decreasing steering wheel angle and the previous steering wheel angle and the first steering wheel angle input (**column 8 lines 25-45**).

As per claim 21,

Ravani discloses a method of operating a vehicle computer model having vehicle information **(figure 1 reference 12)** and path information **(figure 1 reference 20)** therein comprising:

- Determining a plurality of current steering wheel angle inputs to the computer model by comparing a look ahead point and an intended path at various times (**figure 6, column 8 lines 13-19**);
- Determining when the vehicle model is understeering in response to a yaw acceleration (**column 6 equation 11**);
- When the vehicle model is understeering, holding the steering wheel angle to a first steering wheel angle input of the plurality of current steering wheel angles until an error determined as a function of the plurality of steering wheel angle inputs is decreasing (**figures 6b and 6d, shown as steering input remaining at 0 until t=5s**);
- When the error decreases, operating the computer model with one of the plurality of current steering wheel angle inputs subsequent to the first steering wheel angle input (**figures 6b and 6d, shown as steering input being above 0 when t>5s**).

As per claim 22,

Ravani discloses determining a plurality of current steering wheel angle inputs comprising periodically determining the plurality of current steering wheel angle inputs (**figure 6d, taught as the steering inputs being determined as a function of time**).

As per claim 25,

Ravani discloses operating the computer model with one of the plurality of current steering wheel angle inputs subsequent to the first steering wheel angle input comprising operating the computer model with one of the plurality of current steering wheel angle inputs subsequent to the first steering wheel angle input that corresponds in time to a decreased error (**column 8 lines 54-57**).

As per claims 26 and 27,

Ravani discloses determining the error in response to a decreasing steering wheel angle and the first steering wheel angle input (**column 8 lines 25-45**).

Claim Rejections - 35 USC § 103

12. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

13. Claim 6-7 and 15-16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ravani in view of Sano, US Patent No. 5,842,754.

As per claim 6,

Ravani discloses the controller determining when the vehicle model is understeering in response to a yaw acceleration an increasing steering wheel angle (**column 6 equations 12 and 13**). However, Ravani does not disclose expressly the controller determining when the vehicle model is understeering in response to a yaw acceleration greater than a threshold. Sano discloses a turn control apparatus for a vehicle including a yaw-rate-based turn direction (**column 12 lines 37-49**). As seen in the cited text, the turn direction is based on whether a threshold for the yaw rate is exceeded.

It would have been obvious to one of ordinary skill in the art of vehicle simulation, at the time of the present invention, to modify Ravani's steering simulator with Sano's control system in order to achieve a steering simulator that places steering wheel angle inputs based on whether a threshold for the yaw acceleration has been exceeded. The motivation for doing so would have been to improve accuracy in steering (Sano column 2 lines 38-47).

As per claim 7,

Ravani discloses the controller determining an increasing steering wheel angle by comparing the initial steering wheel angle input to the first steering wheel angle input (column 7 lines 32-35).

As per claim 15,

Ravani discloses determining when the vehicle model is understeering in response to a yaw acceleration an increasing steering wheel angle (**column 6 equations 12 and 13**). However, Ravani does not disclose expressly determining when the vehicle model is understeering in response to a yaw acceleration greater than a threshold. Sano discloses a turn control method for a vehicle including a yaw-rate-based turn direction (**column 12 lines 37-49**). As seen in the cited text, the turn direction is based on whether a threshold for the yaw rate is exceeded.

It would have been obvious to one of ordinary skill in the art of vehicle simulation, at the time of the present invention, to modify Ravani's steering simulator with Sano's control system in order to achieve a steering simulator that places steering wheel angle inputs based on whether a threshold for the yaw acceleration has been exceeded. The motivation for doing so would have been to improve accuracy in steering (Sano column 2 lines 38-47).

As per claim 16,

Ravani discloses determining an increasing steering wheel angle by comparing the initial steering wheel angle input to the first steering wheel angle input (column 7 lines 32-35).

14. Claims 23-24 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ravani in view of Nagaoka et al., Japanese patent 07-320188.

As per claims 23 and 24,

Ravani does not disclose expressly the yaw acceleration comprising a normalized yaw acceleration. Nagaoka discloses a method for estimating the yaw rate of a vehicle using the steering angle, wherein the normalized yaw acceleration comprises a steering wheel angle normalized yaw acceleration (**abstract of invention, constitution**).

It would have been obvious to one of ordinary skill in the art of vehicle simulation, at the time of the present invention, to modify Ravani's steering simulator with Nagaoka's use of *normalized* yaw acceleration based on the steering wheel angle in order to achieve a simulation method that determines understeering in response to a steering wheel angle normalized yaw acceleration. The motivation for doing so would have been reduce the burden of a computer operating the computer model by using a presumed yaw acceleration (Nagaoka paragraphs 0005 and 0006).

15. Claims 11-12, 19-20 and 28-29 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ravani in view of Nagaoka, Japanese patent 07-320188.

As per claims 11-12, 19-20 and 28-29,

Ravani discloses determining error in response to a decreasing steering wheel angle and the previous steering wheel angle and the first steering wheel angle input (**column 8 lines 25-45**). Ravani does not disclose, however, the error being determined in response to a difference of the previous steering wheel angle and the first steering wheel angle input compared to a threshold. Yasui discloses a vehicle steering system that determines error by a difference of a

previous steering wheel angle and the first ("desired") steering wheel angle (**column 7 line 62-column 8 line 1**).

It would have been obvious to one of ordinary skill in the art of vehicle simulation, at the time of the present invention, to modify Ravani's steering simulator with Yasui's error detection method in order to achieve a steering simulator that determines error by comparing a difference of a desired steering wheel angle with a previously determined steering wheel angle against a threshold. The motivation for doing so would have been to improve automatic guidance of an automotive vehicle by detecting malfunction (Yasui column 2 lines 3-7).

Conclusion

16. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

"Optimal Preview Car Steering Control," by Sharp et al., published in Vehicle System Dynamics in 2001, discloses a system and method for steering a car to follow a path with minimal error.

"Automated Steering Control System Design for Passenger Vehicle in Consideration of Steering Actuator Dynamics," by Fujiwara et al., published in the Proceedings of the American Control Conference in May 2002, discusses modeling of automated steering.

"Fault Tolerant Force Feedback Actuator for Steer-By-Wire," by Krautstrunk et al., published in Mechatronics 2000 discusses a control system of a steer-by-wire steering system.

"Development of an Automated Steering Vehicle Based on Roadway Magnets – A Case Study of Mechatronic System Design," by Tan et al., published in the IEEE/ASME Transactions

on Mechatronics in September 1999, discusses automated highways and control systems implemented into vehicles for automated steering systems.

"Cooperative Steering System Based on Vehicle Sideslip Angle Estimation from Side Acceleration Data at Percussion Centers," by Hiraoka et al., published in the IEEE Vehicle Electronics Conference in 2001, discusses monitoring path following capability based on a combination of manual steering with automatic steering.

"A Framework for Modeling Human-like Driving Behaviors for Autonomous Vehicles in Driving Simulators, by Al-Shihabi et al., published by ACM in 2001, discusses simulation of human-like driving behaviors for the design of autonomous vehicles.

"Robust Control with Decoupling Performance for Steering and Traction of 4WS Vehicles Under Velocity-Varying Motion," by Yingmin Jia, published by IEEE in 2000, discusses modeling of side forces of a vehicle in motion based on acceleration and braking.

"Vision-Based Lateral Control of Vehicles," by Kosecka et al., published for the University of California at Berkeley in 2001, discloses an automated steering system using computer vision for look ahead.

US Patent No. 6,789,017, issued to Aanen et al. on 9/7/2004, discloses a system for calculating a steering angle position based on signals received from relative positions.

17. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Kimberly Thornewell whose telephone number is (571)272-6543. The examiner can normally be reached on 8am-4:30pm M-F.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Kamini Shah can be reached on (571)272-2279. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

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